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ABSTRACT

This bulletin describes the National Occupational Competency Testing Program, which is designed to give experienced craftsmen objective evidence of their competency in order (1) to obtain academic credit toward a degree, (2) to gain certification as an industrial teacher, or (3) to enroll in an industrial teacher education program. Information is supplied on registration, examination results, types of tests (the examination in each field consists of a written test for technical and factual knowledge and a performance test for manipulative skills), and test preparation. Sample questions are included as illustrations of the multiple-choice written test. A description of the examination's scope is provided for each of twenty-six trades. Besides summarizing the subjects covered on each test, this section indicates the percentage of the test devoted to a particular topic. It also lists any special materials that the candidate is expected to bring to the test site. The twenty-six trades covered are as follow: air conditioning and refrigeration, airframe and power plant, architectural drafting, auto body repair, auto mechanic, building trades maintenance, cabinet making and millwork, carpentry, civil technology, computer technology, cosmetology, diesel engine repair, electrical installation, electronics communications, industrial electrician, industrial electronics, machine drafting, machine trades, masonry, mechanical technology, plumbing, printing, quantity food preparation, sheet metal, small engine repair, and welding. (A separate publication [CE 018 274] provides statistical information on test scores.) (ELG)

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NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

BULLETIN OF INFORMATION

FOR CANDIDATES

September 1978

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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THE NATIONAL OCCUPATIONAL COMPETENCY TESTING PROGRAM

The National Occupational Competency Examinations were developed by skilled tradesmen and test development specialists from every part of the nation. Each examination was reviewed by experienced craftsmen, then revised and pilot tested in Area Test Centers throughout the nation. Competent people from each occupational area and candidates who took the examinations judge them to be fair, comprehensive samplings of the knowledge and skills the particular occupation demands.

The National Occupational Competency Testing Program grew out of a three-year Research and Development Project supported by the U.S. Office of Education. The project staff functioned under the guidance of outstanding vocational educators organized in a Consortium of States.

To keep the testing program responsive to the changing needs of vocational education, the National Occupational Competency Testing Institute (NOCTI) was formed as a nonprofit corporation in June 1973. The Institute is located at 45 Colvin Ave., Albany, N.Y. 12206 An Administrative Board, whose members represent each of the ten regions of the United States and who are elected to serve by the Consortium of States, make the general policies. A Board of Trustees, comprised of leading recognized vocational educators, selected by the Consortium of States representatives, govern the Institute.

This booklet is intended for those individuals experienced in skilled trades or occupations who need to present objective evidence of their competency to become vocational teachers, to obtain academic credit from an institution that recognizes the test results, to become certified or for other reasons. It describes the tests, contains the "Scopes of the Written and Performance Test" for each occupational examination, explains how to register and who to contact to find out when and where the NOCTI Examinations will be administered.

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ABOUT THE PROGRAM

Many state departments of education, industrial teacher-training institutions and other organizations have adopted the NOCTI Examinations to enable tradesmen to demonstrate the knowledge and skills they have acquired on the job. You may be asked to—or wish to—take the examination if you are an experienced craftsman and want to: *enroll in an industrial teacher education program; be certified as an industrial teacher (if you have met the other prerequisites); receive academic credit toward a degree.*

Each of the twenty-four NOCTI Examinations has two parts: a Written Test that measures your knowledge of the field and a Performance Test that measures your skills in performing tasks typical of your occupation. Candidates must take both parts.

HOW TO REGISTER

NOCTI Examinations are offered twice a year in the *FALL* and in the *SPRING*. Registrations are handled by the Area Test Coordinator since he makes all the arrangements for administering both the Written and Performance Tests for his locality.

After you have read this booklet and the *SCOPE* for the particular occupation you wish to take (refer to the Table of Contents), get in touch with the Coordinator in person or by telephone to ascertain what the requirements are for taking the examination, the fee and whether he can accommodate your request to be tested.

If you decide to take the examination, obtain the registration form from the Coordinator. READ the directions on how to fill it out that are on the reverse side. Be sure that you complete all requested information accurately. RETURN the registration form (together with your check for the fee) to the Coordinator no later than the date he specified.

Should your Teacher-Education Institution participate in the NOCTI Program, contact the Head of the Industrial Teacher Education Program for full details. If you reside where no center has been established, contact the nearest Area Test Coordinator or get in touch with the NOCTI Director at
45 Colvin Ave., Albany, N.Y. 12206 Phone: (518) 482-8864

EXAMINATION RESULTS

NOCTI sends the results of your Written and Performance Tests to the Area Test Coordinator and he will forward a copy to you. **No information concerning your scores will be given over the telephone.**

You will have to check with the institution or state to which you are applying as to the acceptability of your scores. The organization using the test results, **Not NOCTI**, determines this matter. Any questions about the test results should be directed to the Area Test Coordinator.

ABOUT THE TESTS

If at all possible, both parts of the occupational examination will be scheduled for the same day—usually a Saturday. Whether this can be done depends on how long the particular examination takes. The Written Test takes approximately three hours and the Performance Test from three to six hours. If the performance part is too long, it probably will be given on another day. Since what you know about your occupation and how well you can perform are essential to good teaching, as well as to job performance, you must take both parts.

The Written Test covers the kinds of knowledge gained on the job (rather than from text books), technical and factual knowledge, understanding of principles and problem-solving abilities. Among the topics included are: *tools and equipment commonly used; properties of materials; calculations used to order materials, set up equipment and carry out procedures; application of scientific principles to problem solving; safety procedures and government regulations.*

The Performance Test enables the candidate to demonstrate the skills that a competent craftsman uses in his daily work. Among the manipulative skills included are: *trouble shooting and making adjustments & repairs; operating typical equipment and machinery; using measuring instruments; observing safe operating procedures.*

PREPARATION FOR TAKING THE TESTS

The content of each NOCTI Examination is described in the relevant *SCOPE* and the best way to prepare is to read the *SCOPE* for your occupation since it outlines what the tests cover and lists what tools, references, materials, etc. you should bring with you to the Center. A review of this material will provide you with a better understanding of the occupational content of the written part and the manipulative skills you are expected to demonstrate in the performance part.

Any questions you have prior to the administration date are to be directed to the Area Test Coordinator. Problems or questions occurring during the actual session are to be addressed to the Test Examiner.

THE WRITTEN TEST consists of multiple-choice questions that cover information, facts, knowledge of basic computation and graphic directions that a competent tradesman applies to his work. You are allowed up to three hours to complete it. Any special preparations are listed in the *SCOPE*.

Bring a watch so you can pace your efforts (no one is allowed to work beyond the specified time limit), three or four #2 soft lead pencils (or mechanical pencil) and a good eraser.

Bring only the books and reference materials that are authorized in the *SCOPE* for your occupation to the center.

You will be asked to complete identification sections on your answer sheet; follow the Test Examiner's instructions carefully as this data will identify your NOCTI record.

EXAMPLES OF WRITTEN QUESTIONS

Since you may not have taken a multiple-choice test recently, the following sample questions will give you some idea of what to expect.

After each question are four choices: A, B, C, D. Select the one which, in your judgment is the best answer. None of the choices may be absolutely correct; none may be the best of all possible answers; but one choice is better than any of the others. Blacken your choice on the answer sheet.

1. You are installing some shelves in a kitchen closet in a space which is 14" in length. Each board rests on brackets 1/2" wide at either end. The only boards available are in the lengths listed below. Which is the most sensible choice?

   A. 13-7/8" B. 13-5/8" C. 13-1/2" D. 13-1/4"

COMMENT: None of the choices are of the size that would provide a snug fit. Choice A comes closest to meeting your needs and thus represents the most sensible choice.

2. The size of drains, sewers and horizontal branches is determined by the number of fixture units and the

   A. total length of the sewer system.
   B. the slope.
   C. distance to the sanitary sewer main.
   D. diameter of stack

COMMENT: Here the item is not a question but an incomplete statement. Your task is to select the factor which determines the size of drains, sewers and horizontal branches. D is the correct choice.

3. Which of the following are necessary precautions that a person should take to manually and safely lift a heavy object?

   A. One foot should be placed slightly in back of the other
   B. Body should not be bent over more than 30°
   C. Hands should be protected by crouching away from the object
   D. None of the above

COMMENT: From your own experience you know that the procedures listed under A, B, and C are not safe for lifting heavy objects. Choice D states exactly that and therefore is the correct choice.

4. You are refinishing a fine piece of furniture and notice a bad spot in the surface of the wood. Which of the following methods would be best to use in repairing the surface?

   A. Fill the bad spot with shellac
   B. Make an inlay with the same kind of wood
   C. Fill the bad spot with glue and sand dust from the same kind of wood
   D. Drill out the bad spot

COMMENT: This question requires a choice of the best method. Some would result in a quick repair; however since the item deals with fine furniture, the best method would be the one that maintains high quality. Consequently, choice B is correct.

5. One of the characteristics of meat that indicates quality is its color. If you wish to buy high quality veal, for which of the following flesh colors should you look?

   A. Milk white B. Pale brown C. Grayish pink D. Bright Red

COMMENT: This question requires knowledge of the color characteristics of certain kinds of quality meats. Choice C is the correct answer.

ANSWER SHEET FOR SAMPLE ITEMS

1 (T)(F) ● ○ ○ ○	4 (T)(F) ○ ● ○ ○	7 (T)(F) ○ ○ ○ ○	10 (T)(F) ○ ○ ○
2 (T)(F) ○ ○ ● ○	5 (T)(F) ○ ○ ● ○	8 (T)(F) ○ ○ ○ ○	11 (T)(F) ○ ○ ○ ○
3 (T)(F) ○ ○ ● ○	6 (T)(F) ○ ○ ○ ○	9 (T)(F) ○ ○ ○ ○	12 (T)(F) ○ ○ ○ ○

THE PERFORMANCE TEST involves the skills, methods and procedures which a competent tradesman utilizes in his work; subsequently the sample jobs have been selected from those typical of the particular occupation.

Bring (or wear) appropriate work clothes and whatever protective devices you would normally use (goggles, face shield) on the job.

Generally, the Performance Examiner supplies materials, hand tools, measuring tools, instruments and needed references. For some occupations, you must bring your own tools; or you may prefer working with your own personal tools. Check the *SCOPE* concerning this for further details.

Since you will be working in a shop that is not familiar, it may help if you know what to expect.

Sufficient time will be allowed for you to become familiar with your surroundings; learn where the tools are located; and check out the equipment.

While you are working on your assignments, the Performance Examiner will observe your procedures. He will evaluate your performance and finished job (or product) much as a foreman does.

The task assignments are those with which you will be familiar as you probably have done them many times on the job. If you tend to be nervous about being tested, be assured that only your performance and completed assignments count.

Proceed at your own pace. Some individuals work faster than others, but speed does not guarantee quality, accuracy or correct methods. In the evaluation of your work, speed is only one factor considered.

SCOPES OF THE NOCTI EXAMINATIONS

The NOCTI Examinations have been designed and developed to evaluate the level of skill and knowledge that a person has acquired in his special field as compared to other experienced individuals in the same occupation. To assist candidates in preparing for the examination, the subject matter of each of the twenty-four examinations has been outlined in a summary—*SCOPE OF THE WRITTEN AND PERFORMANCE TEST*. (Refer to Table of Contents)

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF AIR CONDITIONING AND REFRIGERATION EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

5% Domestic Systems Installation

Measuring temperatures & pressures; methods of heat transfer; principles of the refrigeration cycle; utilization of proper tools; principles of soldering & welding various tubing connections.

10% Domestic Systems Servicing

Principles of gauges & thermometers; principles of the compression system; servicing hermetic compressors; construction & operation of relays; motor construction & application.

15% Commercial System Installation

Principles of refrigeration piping; determining load calculations; operation & principles of metering devices, dehydrators & multiple systems; principles & procedures of evacuating a system; oil characteristics; year-round air conditioning.

20% Commercial System Servicing

Methods of leak testing, charging & discharging systems; methods & principles of testing electrical systems; servicing & testing metering devices; methods of defrosting; year-round air conditioning.

PERCENT OF TEST

15% Residential Air Conditioning and Heating Installation

Comfort standards of heating & cooling; building construction; heat transfer calculations; equipment selection; psychrometrics; air distribution; duct design; National Refrigeration Safety Code.

20% Residential Air Conditioning and Heating Service

Troubleshooting; compressor replacement; maintenance procedures; system balancing; safety procedures; customer relationships.

5% Industrial Refrigeration Installation

Building construction; heat gain & loss calculations; equipment selection; blueprint reading; equipment setting; piping techniques; methods of controlling temperature; safety; National Code Requirements.

10% Industrial Refrigeration Service

Controlled area temperatures & conditions; pressure-temperature-humidity relationships; diagnosing procedures for servicing; lubrication systems; modulating unloaders; functioning of relays, starters, contactors & circuit protection.

PERFORMANCE TEST
TIME: 5 hours

33% Domestic Systems Installation and Service

Measure pressures & temperatures with appropriate instruments & gauges; solder & weld various tube connections; service of hermetic compressors; operate, check & repair relays; install, check & operate motors.

33% Commercial System Installation and Servicing

Evacuate & charge a system; install refrigeration piping; test for leaks; test electrical systems.

34% Residential Air Conditioning and Heating

Troubleshoot residential units; maintain and replace compressor; balance a system.

PREPARATION: Personal tools may be used; Handbooks & references will be provided.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF AIRFRAME AND POWER PLANT EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

38% General

Electric circuits in aircrafts; principles of weight & balance; weight & balance computations; types of fluid lines & fittings; specifications & requirements for ground operation & servicing; principles & materials for cleaning & corrosion control: trade calculations; maintenance forms & records; basic scientific principles applied to the service & maintenance of aircraft; procedures & methods for aircraft inspection; utilization of maintenance publications.

28% Airframe - Systems and Components

Kinds & types of structures; types & kinds of aircraft covering & finishes; types & application of aircraft finishes; kinds & types of sheet metal structures; principles & procedures for assembly & rigging; principles & methods of welding; principles of operation & methods of servicing the following: aircraft landing gear systems, hydraulic & pneumatic power systems, aircraft instrument systems, cabin atmosphere control system, aircraft fuel systems, aircraft electrical systems.

34% Power Plant Operation and Maintenance; Systems and Components

Principles of operation, specifications & methods of maintaining & overhauling of reciprocating & turbine engines; principles of operation, specifications & methods of servicing the following systems: engine instrument, engine fire protection, engine electrical, lubrication, ignition, fuel metering, engine fuel, induction, engine cooling, engine exhaust & propellers.

PERFORMANCE TEST
TIME: 5- 1/2 hours

16% Sheet Metal Work

Layout & measure; cut, shape & form parts; select & use rivets & other fasteners.

6% Generator Service

Inspect & analyze condition of generators.

16% Use of Airworthiness Directives

24% Hydraulic Components and Systems

Disassemble, inspect components for defects using proper overhauling procedures & techniques.

16% Engine Ignition Timing

Analyze & check engine timing using proper corrective procedures.

10% Engine Valve Service

Interpret specifications; determine valve condition; use of proper equipment, installation procedures, measurement techniques & corrosion prevention.

12% Carburetor Service

Disassemble & assemble using proper procedures; make corrective adjustments with the use of special tools.

PREPARATION: Personal tools may be used. Shop manuals & specifications will be provided.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF ARCHITECTURAL DRAFTING EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

20% **Basic Architectural Data**

Tools & equipment; symbols & conventions; calculations for drawings; standards.

30% **Planning and Design**

Codes & regulations; spatial & structural organization; aesthetic judgment; practical material selection; site & surrounding relationship; building equipment requirements; traffic and circulation.

PERCENT OF TEST

35% **Materials and Methods of Construction**

Concrete; masonry; metals; wood & plastics; thermal & moisture protection; doors & windows; finishes; mechanical; electrical.

10% **Structural Systems**

Design; codes; forms; analysis.

5% **Administration**

Legal & ethical considerations; professional relationships.

PERFORMANCE TEST
TIME: 5 hours

20% **Sections**

Prepare sections for various items of construction from front elevations & partial floor plans of residence or commercial buildings.

30% **Working Drawings**

Prepare working drawings from preliminary sketches of floor plans for the builder to follow.

15% **Structural Items**

Present on working drawings all required structural items.

15% **Electrical Items**

Present all electrical items required.

10% **Heating**

Indicate all necessary heating information.

10% **Perspective and Renderings**

Make freehand perspective drawings and renderings.

PREPARATION: Bring a set of drawing instruments, drawing pencils (lead holder & leads), slide rule, architect's scales, erasers, erasing shields. If desired, you may bring a lettering guide & Kidders (or other architects and builders) Handbook & Standards.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF AUTO BODY REPAIR EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

15% Welding

Principles of operation of various types of welding apparatus; types & kinds of welding done in auto body repair; adjustment of welding equipment; types & kinds of nozzles; identification of quality welds; principles of oxygen & acetylene welding; safety precautions.

25% Sheet Metal Repair

Principles of shrinking, leading & stretching metal; steps & methods in panel repair; characteristics of metals--hardness, plasticity, rigidity, elasticity; forming of metals; identification of tools & equipment in metal repair; nature & function of fillers--plastics, lead; use & operating principles of body repair equipment & machines.

25% Refinishing

Effect of weather conditions on painting & finishing; operating principles & use of painting equipment; use of lacquers & thinners; common defects & how to avoid them; surface preparation for finishing; paints & their characteristics; color combinations & matching of color; safety procedures.

PERCENT OF TEST

7% Glass: Trim and Hardware

Common fastening devices; construction of doors & panels; types of glass; trim--how to remove & mount.

10% Panel Sections

Construction of panels; methods of adjustments, removal & replacement; special methods for repair and adjustment.

10% Frame Alignment

Principles of operation of machines & equipment; frame straightening procedures & principles; diagnostic procedures.

5% Electrical Circuits

Electric Systems on automobiles; troubleshooting the wiring system.

3% Estimating

Appraising collision damage; writing estimates; use of manufacturer's handbooks & reference material.

Safety

Shop safety; proper use of power tools; combustible material storage.

PERFORMANCE TEST
TIME: 6 hours

50% Sheet Metal Repair

Metal bumping & finishing on high & low crown panels; shrinking stretched metal; leading & use of plastics for filling; proper use of body tools & equipment; oxy-acetylene welding of sheet metal; setting up of oxy-acetylene equipment.

30% Refinishing

Select & use spray equipment; apply masking materials, primers, putties & sealers; apply acrylic lacquers & enamels.

10% Body Construction

Adjust & align doors & window glass; remove & replace glass, trim, hardware & body panels.

10% Electrical

Troubleshoot brakelight system, dome light circuit, headlight circuit; check electrical power systems.

PREPARATION: Handbooks and reference material will be provided; however, candidate may bring his own.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF AUTO MECHANIC EXAMINATION

WRITTEN TEST
TIME: 4 hours

PERCENT OF TEST

5% Basic Shop Principles & Practices

Hand tools; fittings & fasteners; interpretation of manuals, charts, diagrams & specifications.

15% Engines

Overall engine operation: heads, cylinder block, valves & valve mechanisms, piston & connecting rod assembly, crankshaft & bearings, lubrication systems, oil pump & filter, cooling systems, exhaust systems.

10% Emission Systems

Fundamentals of Emission Control; crankcase ventillation; exhaust emission; vapor control systems.

15% Engine System Analysis and Repair

Use & interpretation of engine testing devices, ignition systems, fuel systems, emission systems & engine mechanical systems.

10% Suspension, Steering and Braking

Suspension; alignment; steering; springs; wheels & tires; braking systems; chassis lubrication.

PERCENT OF TEST

10% Fuel Systems

Carburetors; fuel pumps; intake manifolds; induction systems & fuels.

10% Electrical

Diagnosis of electrical circuit malfunctions: starter system, ignition system, charging system--AC-DC, lighting & warning systems, battery and electric power distribution.

10% Drive Line and Components

Gears, bearings & seals; standard transmissions & clutches; overdrive units; automatic transmissions & control circuits; drive lines and universals; differentials & final drive units.

10% Accessories

Heaters; air conditioning: automatic temperature control; automatic seats; speed controls; automatic windows; windshield wiper & washer systems.

5% Shop Management and Control

Service diagnosis; job pricing & estimating; repair order writing; service routing & management.

PERFORMANCE TEST
TIME: 5 hours

12% Engines

Inspect, repair or replace pistons & connecting rods, valve train, cylinder heads, cylinder block, valve stems & guides, bearings & journals, pistons, cylinders; service valves, valve seats, bearings, pistons, rings, connecting rods & cylinder walls; use of precision gauges and indicators.

4% Basic Automotive Practices

Identify major automobile parts: engine, brakes, front end, fuel, emission, charging, starting systems, air conditioning.

5% Fuel Systems

Inspect, adjust & repair: carburetor circuits, float settings, fuel/air ratio, high & low idle.

8% Electrical

Inspect, adjust & repair: electrical components, electrical malfunctions, ignition timing; test instruments & equipment.

5% Batteries

Inspect & service for condition; test for charge with hydrometer; perform battery capacity test (B.S.T.); charge battery according to specifications.

10% Air Conditioning

Use air conditioning testing gauges & equipment; bleed gauges & identify state of charge; follow manufacturer's charging procedures; test system for leaks.

8% Charging Systems

Diagnosis, repair & service alternators, regulators & components; instruments & equipment; inspect charging system.

8% Emission Systems

Identify the correct emission system for the year in which the automobile was manufactured; diagnosis & test emission system components; inspect emission system for proper installation.

12% Engine Analysis and Repair

Inspect engine & accessories for wear & damage, interpret oscilloscope patterns, detect & correct engine malfunctions by use of proper instruments & equipment.

8% Drive Lines and Components

Determine end-play & backlash with dial indicator; interpret gear tooth patterns; check & adjust automatic transmission, check & adjust hypoid differential.

6% Suspension and Steering

Prepare automobile (on rack) for alignment; measure camber, castor & toe-in; make alignment adjustments; check steering wheel to see that it is centered.

10% Brakes

Inspect & repair cylinder bore & rotor; overhaul piston assembly and/or caliper assembly; torque caliper to spindle & wheel bearings.

PREPARATION: Personal tools may be used. Test equipment, shop manuals & specifications will be provided.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE
SCOPE OF BUILDING TRADES MAINTENANCE EXAMINATION

Written Test -- 3 Hours

12% Heating, Air Conditioning and Refrigeration
Basic principles, controls, service requirements, troubleshooting, techniques, motors, small engines.

12% Carpentry
Tools, safety, standards, methods of fabrication, principles and practices cabinetry, related math.

10% Masonry
Trade tools, layout procedures and practices, safety, materials.

5% Custodial
Floor care, materials, processes.

12% Electrical
Principles, practices and procedures for installation of electrical power and equipment, (layout, cable, Bx) safety procedures, code provisions.

12% Painting and Wallpapering
Preparation, practices, materials, applications to different surfaces, care of tools and equipment, safety.

12% Plumbing
Operating principles and installation of commonly used materials and supplies. Installation of drains, plumbing fixtures tools, materials and equipment, service facilities.

3% Management Practices
Human understanding, dealing with people, supervisory practices, related math.

12% Sheet Metal
Materials, properties, working characteristics, tools and equipment, fabrication and assembling, knowledge of fluxes, applications.

10% Welding
Basic knowledge of oxy-acetylene and arc welding joint design, materials, tools and procedures safety practices.

Performance Test -- 5 Hours 35 Minutes

13% Masonry
Layout the bond, meeting dimensions stretcher, construction practices tools, efficiency. Uniformity of joints, plumb/level square, general appearance.

13% Welding
Set up of materials to be joined (brazing, soldering, arc welding) of equipment and torch, correct tip, flux and filler selection, current and rod selection. Use of test equipment and grinding.

10% Carpentry
Dry wall construction, layout, squareness accuracy, wallboard application and jointing.

10% Surface Coating
Preparation of surfaces, undercoating, application of finishes, use and care of equipment.

13% Electrical Installation
Wiring methods (Bx cable) lighting systems, switches, fixtures.

20% Plumbing
Installation of fixtures and accessories on a variety of materials (toilets, basins, etc.). Cut ferrous and non ferrous pipe, thread pipe, join and caulk. Testing of system under pressure.

5% Door Hardware
Hydraulic closures, speed, latching.

6% Glass Installation
Cut glass, remove and install glazing.

10% Custodial Services
Floor care, glass cleaning, interior dusting.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

CABINET MAKING AND MILLWORK EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

9% Planning

Read & interpret blueprints & plans (i.e. dimensions, specifications, material list, quantities); lumber dimensioning & size consideration; estimate price & measurements.

5% Safety

Safety color codes; electrical safety; floor condition (area cleanliness); fire extinguishers; fire prevention practices; material storage.

24% Machines

Principles of operation; safety devices & methods; use of attachments; specific functions; scope of consideration (bench saw, jointer, shaper, drill press, lathe, sanders).

16% Hand Tools

Identify tools & their functions; maintenance of tools; use of layout tools; use of hand saws, block planes, files, scrapers, chisels & clamps.

PERCENT OF TEST

9% Wood/Stock Selection

Identify wood type; grade wood quality; match stock; classify wood (size, finish, symbols).

12% Joinery

Identify joints & molding; types & uses of glue; select & use fastening devices (nails, screws, dowels); joint strengthening devices.

10% Assembly

Utilization of cabinet hardware; identify cabinet terms; use of fastening devices; wood bending; select & use proper clamping tools.

15% Finishing

Use of fillers, sealers, waxes, bleaches, stains, abrasives & wood cleaning agents; spraying methods; selection & care of brushes; relationship of wood type to finish.

PERFORMANCE TEST
TIME: 5 hours

17% Planning and Layout

Estimate lumber requirements from prints; plan sequence of operations; check job specifications; layout material.

3% Wood/Stock Selection

Select lumber; check lumber for possible defects; match lumber (grain, texture, pattern).

20% Hand Tools

Use layout tools, doweling jig, wood chisels, assorted common hand tools (screw driver, hand drill, hammer, hand saw, etc.) & clamping devices (handscrews, bar clamps, etc.).

4% Safety

Know safety procedures in handling tools, machines & work areas.

20% Machine

Set up & operate: bench saw, jig saw, drill press, planer, jointer, spindle & belt sanding machines; select proper saw blades, drills & bits.

13% Joinery

Prepare dado joints & miter joints; fasten with wood screws; prepare stock for joining with dowels.

13% Assembly

Assemble with dowels, glue & clamps--wood screws--miter joint--dado joints; make trial assemblies.

10% Finish

Sandpaper & finish sanding; clean & prepare surface for staining; remove small defects; select and apply spray stain; apply spray finish.

PREPARATION: Personal tools may be used. References will be provided.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF CARPENTRY EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

5% Surveying, Layout & Blueprint Reading

Interpretation of building codes, specifications, & blueprints; determination of property line; types & mounting of batter boards; usage & operation of the builder's level; soils and soil testing; 3-4-5 triangle calculations; determination of depth of excavation.

5% Foundation Work

Interpretation of building codes, specifications, & blueprints; determination of elevation of footings; principles of construction of footing & wall forms; types of materials; strength of concrete, curing concrete; provision for openings in concrete walls; usage of plumb bob in transferring lines.

5% Concrete Walks, Floors & Step Construction

Interpretation of building codes, specifications, & blueprints; methods of placing concrete, reinforcing concrete, screeding, floating, troweling, parting & edging of concrete; principles of layout forms, steps and railings.

9% Floor Framing

Interpretation of building codes, specifications, & blueprints; installation of girders & posts, types of floors, types of materials (wood, metal hangers, fasteners); selection, care & usage of hand tools (saw, brace, auger bits, 100 ft. tape hammer).

10% Wall and Ceiling Framing

Interpretation of building codes, specifications, & blueprints; fabrication of lintels and corner posts; western and baloon construction; plumbing & bracing; determination of studs, trimmer, lintel, cripple & rough opening sizes; methods of tieing walls together; installation & usage of fire block & backing.

5% Estimating

Excavation quantities; concrete, reinforcing steel & forming materials; floor & ceiling joists; wall framing & sheathing materials; roof framing, sheathing & covering materials; outside finish materials (molding, siding); interior finish materials (moldings, coverings, hardware); insulation and acoustical materials.

PERCENT OF TEST

2% Scaffolding

Principle of construction for double pole scaffold; scaffold with brackets; safety as applied to scaffolding.

13% Roof Framing and Roofing

Interpretation of building codes, specifications, & blueprints; roof terminology & design; rafter layout (common, hip, valley, hip jack, valley jack & cripple); framing square & rafter tabler; usage of radial arm saw, portable electric saw & plumb bob; toe nailing; cutting gable studs; louvers & purpose of ventilation; methods of flashing; types of materials; methods of applying wood shingles, composition shingles & built-up roofing; installation of gutters & drain pipes; safety measures.

5% Stair Construction

Interpretation of building codes, specifications, & blueprints; stair design; layout of stair horses; use of framing square, dividers & portable electric saw; methods of installing finish tread & riser; installation of handrail.

15% Interior Finish

Interpretation of building codes, specifications, & blueprints; application of sheet rock & taping processes, prefinished panels, installation of door jambs, doors (swinging, pocket and bi-passing), casing, baseboard & shoe, finish hardware (clothes rods, towel bars, mirrors, bathroom fixtures, railings, access covers); laying finish flooring; usage of butt gauge, lock template, scraper, nail set, abrasive paper, miter saw, router, belt, portable planer & oscillating sander.

9% Cabinetry

Interpretation of building codes, specifications, & blueprints; installation of prebuilt wall & base cabinets, plastic laminate counter top, building cabinets in place; usage of shaper, mortising attachment, router, fasteners, clamps and adhesives.

17% Exterior Finish

Interpretation of building codes, specifications, & blueprints; types of cornices & roof trim; installation of exterior door jambs & window frames; setting columns & beams for porch or roof overhangs; application of siding & types of siding; installation of overhead doors, exterior doors & storm doors; application & types of insulation; preparation of surfaces & installation of acoustical tile.

PERFORMANCE TEST
TIME: 5 hours

10% Floor Framing

Installation & layout of sills, girders, posts, floor joists; bridging & subfloor.

20% Wall Framing

Plate layout & installation of framing members; fabrication of lintels & corner posts; western & balloon construction; tieing walls together.

30% Roof Framing

Layout & installation of rafters from roof plan; mount gable studs; sheath sides & gable ends; use of power equipment.

10% Roofing

Apply shingles; finish to edges on various types of roofs.

30% Exterior Finish

Install cornices, exterior door & door stop; apply courses of siding.

PREPARATION: Personal tools may be used. It is recommended that you bring your own portable power saw.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF CIVIL TECHNOLOGY EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

11% Asphalt

Principles & procedures for testing asphalt mixtures; principles of plant mix design: methods of quality control in laying asphalt pavement.

13% Soil

Origin, identification & classification of soils; methods of soil sampling & testing; engineering principles in the application of soil as a construction material; physical properties of the various soil types.

11% Concrete

Principles in the design of quality concrete; procedures for testing plastic & hardened concrete; recommended practices in the mixing, placing, finishing & curing of concrete; concrete for special purposes.

19% Surveying

Chaining procedures & computations; volume determination; instruments (identification, set-up, adjustment & use); notekeeping; area determination & identification; staking nomenclature & computations; triangulation computations & theory; curves (theory & computations); related information pertaining to surveying.

PERCENT OF TEST

9% Instrumentation

Temperature measuring devices--theory of operation, conversion between various scales; principles of pressure, himidity & flow metering devices; fundamentals of electricity (application of Ohm & Kirchoff laws); methods used in determining specific gravity-method of analyzing gases; measurement of conductivity PH and viscosity of fluids (utilization of results for practical application); transmission of measured value of a variable in process instrumentation; process instrumentation-types of signals transmitted.

19% Steel Structures

Structural connection--theory & design; mechanics of beam design; nomenclature used by steel industry; principles & methods of testing steels.

4% General Engineering Information

Mathematics & facts related to the work of a Civil Engineering techrologist.

14% Drafting

General knowledge of drafting procedures; geometry pertaining to drafting; principles of topography; graph identification; dimensioning procedures; sketching procedures; pictorial drawings; sectioning procedures.

PERFORMANCE TEST
TIME: 5 hours

18% Concrete

Use of balances & sample splitters, Gilson-type Mechanical Screen & Ro-tap or other standard sieve shaker; calibrate unit-weight bucket by use of water; rod & tamp aggregate sample; rod plastic concrete; test plastic concrete for slump.

18% Soils

Use of balances & sample splitters, Gilson-type Mechanical Screen & & Ro-tap or other standard sieve shaker, "Speedy" moisture tester; set up, adjust & operate liquid limit device; read conversion tables & calibration charts; plot curves on semi-log paper.

16% Asphalt

Use of balances & sample splitters, Gilson-type Mechanical Screen & Ro-tap or other standard sieve shaker; rod & tamp aggregate sample; use Marshall testing machine equipped with a proving ring, stability testing head and flow meter.

28% Surveying

Use various surveying instruments & equipment to perform actual field problems (chains, levels, transits).

20% Drafting

Use drafting machine, other related equipment & accompanying techniques to draw a map of a given area.

PREPARATION: All necessary hand tools, machinery & Handbooks will be provided. Candidates are to bring slide rules and drafting instruments.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF COMPUTER TECHNOLOGY EXAMINATION

Written Test - 3 Hours — 180 Multiple Choice Questions

25 % General Information

Items that normally relate to all specialty areas; operations, programming, and analysis.

20 % Data Processing Machine Operations

Items that relate primarily to computer operations, key entry, unit record equipment operations, and peripheral equipment operations.

45 % Computer Programming

Items that relate directly to programming languages; i.e., COBOL, FORTRAN, RPG, etc.

10 % Systems Analysis and Design

Items that relate to systems concepts, design, flow charting, and documentation.

Performance Test - 4 Hours

50 % Data Processing Operation

Keypunch, sort, operate, collate.

50 % Programming

Writing programs, keypunching, debugging.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF COSMETOLOGY EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST		PERCENT OF TEST	
8%	Care of Hands and Feet Manicuring, nail repair, artificial nails, reconditioning manicure; hand & arm massage; electric manicure; pedicure	4%	Care of Hair and Scalp Scalp care; corrective treatments for scalp; hair conditioning treatments
7%	Shampoos and Colorless Rinses Specialized shampoos	9%	Hair Straightening Hair pressing; wet setting of pressed hair; croquignole marcel on pressed hair; chemical method
9%	Permanent Waving Cold wave, corrective wave	7%	Hair Shaping Cutting children's hair
21%	Hair Styling	7%	Facial Treatments Packs & masks; correction of simple conditions
15%	Haircoloring Corrective treatments; eyebrows & lash tinting; bleaching	2%	Removal of Superfluous Hair
3%	Hair Pieces	3%	Professional Makeup
		5%	Shop Operation and Management

PERFORMANCE TEST
TIME: 5 hours

20%	Manipulative Techniques of Hairstyling Design and execution of a styling pattern with corresponding sides	10%	Hair Coloring Tinting, bleaching, retouching
		OR	
20%	Haircutting Shaping and styling to model's features		Thermal Curling Methods, Safety
20%	Hair Styling Application of rollers	10%	Manicure Preparation, finishing
20%	Permanent Waving Cold waving, neutralizing	OR	
OR			Facial Makeup Professional makeup
	Chemical Hair Straightening Application of approved methods and chemicals		

PREPARATION: One live model and one manikin are required for the examination. A second live model may be substituted for the manikin. Models should be selected by the candidate on the basis of suitability for demonstrating the candidate's competency in hair styling, using either permanent waving, hair coloring, or hair straightening.

Candidate should bring: Haircutting tools, permanent wave rods (appropriate size), chemical straightener or relaxer (preferred brand), hair clips, combs, brushes, rollers, hair piece, wig or wiglet, tints or toner (preferred brand), protective gloves and apron, manicure tools, thermal curling irons (if needed). Towels, shampoo, peroxide, cotton, standard shop equipment will be furnished.

Upon arriving at the examination, the candidate shall submit to the Examiner the published plan of the hair style he/she intends to execute & a photograph of the finished style. However, if the candidate wants to submit an original plan, he/she may do so; it must be of professional quality. If the plan is written rather than diagrammed, it must be typed, double-spaced, 1-1/2" margins on 8-1/2" x 11" paper. A photo of the finished style MUST accompany the plan. In any event, the photo shall be no smaller than 5" x 7" and no larger than 8" x 10". Neither the plan nor the photo will be returned to the candidate.

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NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF DIESEL ENGINE REPAIR EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

25% Fuel Injection Pumps & Nozzle Repair and Adjustment

Principles of operating the basic fuel injection systems of Robert Bosch, American Bosch (in-line & distributor types), CAV (in-line & distributor types), Simms, GMC, Cummins, Caterpillar, Roosa Master (DC, DB & C Models); principles of operating injection nozzles, Centrifugal and hydraulic governors of the above systems.

15% Hydraulic Systems Troubleshooting & Repair

Basic principles, Pascel's Law, Bernoulli Principle, etc; principles of operating pumps, control valves, pressure, flow, directional & troubleshooting; function of reservoirs & accessories, actuators; principles & operation of basic air devices; principles of operation & testing procedures on cylinders & motors.

20% Electrical Systems Diagnosis & Repair

Basic electrical theory & its application to electricity; principles of DC & AC generator operation & function; principles & function of operating the ignition system; principle & operation of the starting systems; pre-heat systems and accessory systems, knowledge of current diagnosis & repair procedures for all electrical systems.

PERCENT OF TEST

15% Power Train Operation and Repair

Principles of clutch operation & methods of adjustment; standard transmission operation & methods of diagnosis; power shift transmission troubleshooting; ring gear & pinion functions & adjustment; operation of final reduction drives including planetary and bull gear types; principles of PTO power units (mechanical & hydraulic), brake operation (mechanical & hydraulic).

25% Basic Engine Diagnosis and Repair

Principles & functions of troubleshooting, diagnostic methods for determining engine problems & needed repairs; current methods of refinishing valve faces, valve seats & valve guides; proper measurement & methods of repairing or replacing cylinder area; methods of checking clearances & determining need for replacement of crankshaft units; disassembly & assembly procedures to insure proper performance of the completed engine; adjustments & minor tune-up to be performed on all engines after final assembly.

PERFORMANCE TEST
TIME: 4 hours

10% Fuel Injection Pump & Nozzle Repair and Adjustment

20% Testing and Calibrating Pump Systems

Testing & calibrating injection nozzles; servicing centrifugal & hydraulic governors.

35% Basic Engine Diagnosis and Repair

Adjustments & minor tune-up on engines; current methods of refinishing valve faces, valve seats; & valve guides; repair of cylinder area; servicing crankshafts; troubleshooting to determine engine problems.

10% Electrical Systems Diagnosis and Repair

Generator & alternator performance tests and repair.

10% Hydraulic Systems Troubleshooting & Repair

Troubleshooting & repair of control valves; operating, testing & repair of actuators; repair of basic air devices.

15% Power Train Operation and Repair

Power shift transmission repair; methods of clutch adjustments; standard transmission repair; hydraulic & mechanical brake repair; service & repair of PTO power units; service to ring gears & pinions.

PREPARATION: Personal tools may be used.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF ELECTRICAL INSTALLATION EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

10% Reading of Working Instructions

Interpretation of floor plans, schematics & wiring diagrams; recognition of symbols. Interpretation of specifications & application of the National Electric Code.

5% Utilization of the National Electric Code

Responsibility for enforcement; major provisions of concern to the electrician; national & local relationships for the application & modification of code provisions.

15% Principles, Practices & Procedures for Installation of Electric Power for Residential, Commercial & Industrial Structures

Quality & workmanship; wiring practices & procedures (layout, conduit, cable, Bx, single & multiphase, welding procedures).

5% Principles of Electronics Applied to Electrical Installation

Static systems; solid state systems (semiconductors); test equipment.

10% Preventive Maintenance & Troubleshooting

Code provisions for maintenance; use of instruments & tools; rotating machinery & equipment controls & circuits.

PERCENT OF TEST

5% Safety Practices and Regulations

Work safety practices & standards; safety regulations concerning installation & operation of rotating machinery & equipment; special code regulations concerning light & power circuits & controls.

15% Principles of Operation & Installation of Controls & Rotating Equipment

AC-DC motors-generators; circuit controls; systems (solid state, remote, air-temperature, sound).

20% Basic Principles of Electricity & Magnetism and Their Application in the Trade

Series, parallel & combination circuits (theory & calculations); AC-DC machinery & equipment; power generation & controls; principles of lighting circuits & controls; communication systems & controls (signal, alarm, sound).

10% Trade Calculations

Material requirements; load calculations & wire size.

5% General Trade Information

Employer-Employee relationship; business-customer relationship; payroll & time calculations.

PERFORMANCE TEST
TIME: 5 hours

10% Layout and Print Reading

Code interpretation; selection of materials & supplies; plan wiring installations according to NEC regulations

25% Installation, Testing & Operation of Controls

Distribution systems, domestic-commercial (single and/or multiphase); install and/or mount equipment on various surfaces found in buildings; mount various kinds of starters & switches.

10% Code Applications

30% Installation of Residential, Commercial Wiring

Wiring methods (Bx, Conduit, EMT); signal systems & alarms; lighting-heating-air conditioning wiring.

20% Testing & Troubleshooting of Installations

Rotating equipment; signal systems; alarm systems; starters & switches.

5% Safety

PREPARATION: Personal tools may be used. You may also bring your own reference material or Handbooks.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF ELECTRONICS COMMUNICATIONS EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

8% Basic Electricity

DC CIRCUITS: Series - Characteristics & calculations (voltage drop, total current, power, total resistance, etc.); Parallel - Characteristics & calculations (voltage drop, total current, power, total resistance, etc.); Combinations - Series - parallel (equivalent resistance, voltage drop, total current, power, total resistance, etc.); voltage divider calculations.

5% Measurements, Standards and Tolerances

Calculation of shunts for ammeters; calculation of multiplier resistors for voltmeters; meter sensitivity & loading effects; Ohmmeter circuitry; Oscilloscopes as voltmeters; determination of unknown frequencies with an oscilloscope; observing waveshapes with an oscilloscope.

2% Conductors, Insulators and Semi-conductors

Factors affecting resistance of copper conductors, conductivity of semi-conductor materials; effectiveness of various materials as insulators.

1% Batteries, Source of Voltage

Primary cells (zinc-carbon, alkaline); secondary cells (lead-acid, nickel-cadmium).

19% Vacuum Tube & Solid State Devices

BASIC ASPECTS: static characteristics, dynamic characteristics, biasing, transistor characteristics; other semi-conductor devices.

PERCENT OF TEST

9% Amplifiers in Cascade for RF and AF

Coupling methods; decoupling; frequency response; inverse feedback; gain or attenuation (db); voltage vs. power amplifiers; optimum transfer of energy.

5% Other Concepts, Electronics

Amplitude modulation; frequency modulation; pulse definitions; logic concepts.

4% Inductive Devices

Transformer operation & calculations (phase, voltage, & current relationships, regulation); radio-frequency inductors (rf, if, powered iron & air core, single & double-tuned).

4% Alternating Current

Basic concepts (RMS, effective, peak, peak-to-peak values); effect of inductance in an AC circuit; effect of capacitance in an AC circuit.

12% Single Phase Circuits

Series (R,L,C); Parallel (R,L,C); Resonance (series, parallel); R-L & R-C time constants.

15% Electronic Circuits

Power supplies; vacuum tube amplifiers; Oscillators (including multivibrators); semi-conductor devices.

16% Methods and Procedures

Trouble identification; methods of correction; methods of maintenance & adjustment.

PERFORMANCE TEST
TIME: 4 hours

33% Radio Equipment

Alignment of AM & FM radios; component failures (shorts or opens); repair of low power transmitters.

17% Recording Equipment

Adjust mechanical malfunctions of record changers or tape transports; knowledge of cleaning or drive mechanisms of record changers & tape transports.

50% Television Service

Component failures; adjustment of service controls; sound section repairs & adjustments; sweep circuit repairs & adjustments; R-F oscillator tuner adjustments; color receiver field adjustments; trap adjustments (4.5 mh).

PREPARATION: Personal tools may be used; Allied Data Handbook may be consulted.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF INDUSTRIAL ELECTRICIAN EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

10% Fundamental Knowledge of Electricity & Electronics Applied by the Industrial Electrician

Magnetism: sources, magnets, electromagnets, batteries, conductors, insulators, electric current & electric circuits.

15% Basic Concepts & Application of Direct Current to the Operation, Testing, Maintenance & Repair of Electric Power Equipment

Determination of volts, ohms, watts, conductance using various laws & principles applied to industrial electrical work; principles of operation of series & parallel circuits, various types of meters, electric motors & generators (their maintenance, repair & installation); determination of efficiency of various power units.

PERCENT OF TEST

15% Basic Concepts & Application of Alternating Current to the Operation, Testing, Maintenance and Repair of Electric Power Equipment

RL & RC circuits; series & parallel resonance; inductance-capacitance; transformers; filters.

30% Operating Principles and Concepts of Power Generation and Distribution

Installation, maintenance & repair; transformers; distribution systems; load calculations and appreciation of National Electric Code.

30% Operating Principles and Concepts of Motors and Controls

Installation, maintenance, repairs; machine circuits; AC & DC motors; types & operation of controls.

PERFORMANCE TEST
TIME: 5 hours

20% Conduit and Tubing

Bend, shape offset or form conduit, metallic tubing, Bx; thread conduit tubing, cut Bx & cable; join tubing.

20% Connect Distribution System

Single; three-phase; transformers.

20% Installation, Service and Repair of Fluorescent Light System

Troubleshooting, maintenance, replacement and repair.

40% Wiring

Wire magnetic starters, motors, generators, controls & switches; mount starters, boxes & wire according to National Electric Code Standards; make wiring diagrams from given directions; troubleshoot magnetic control devices, motors & generators.

PREPARATION: Personal tools may be used.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF INDUSTRIAL ELECTRONICS EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

16% Basic Electronic Fundamentals

Basic physics involving atomic structure, conductor, insulator, semi-conductor, electrical terms & units; fundamentals of magnetism-resistance circuits; measuring devices, circuit analysis; sine wave characteristics; resonance amplifiers, semi-conductor fundamentals.

10% Digital Circuits

Computer definitions, block diagrams; associated circuitry; computer circuitry, fundamentals of switching; number system; Boolean algebra, electronic logic; sequential networks; minimization methods.

6% Network (Passive)

DC circuit analysis, network theories & laws; inductance in series & parallel, impedance in R-L Circuits & R-C Circuits; Resonance R-LC Circuits, Gas Tubes.

8% Electronic Control Devices

Application & use of transistors, thyratrons, transistor circuit configuration, characteristic curves.

16% Amplifiers, Detectors and Active Circuits

Test & analyze power supplies, amplifiers, transistor amplifiers, integrated circuits, transistor oscillators, basic oscillator circuits, R-F amplifiers, modulation & detection, non-sinosoidal waveshapes, relaxation oscillators, wave shaping circuits, industrial timer, industrial rectification & inversion, electronic heating.

PERCENT OF TEST

10% Components

Capacitance--capacitors in series & parallel, transformers, vacuum tube fundamentals, triode vacuum tubes, tetrodes & pentodes, multigrid & special purpose tubes, integrated circuits, silicon controlled rectifiers, photo electric devices.

10% Use of Instruments

Measuring devices, meter movements, ammeter, ohmmeter, voltmeter, multimeter, cathode ray oscilloscope, sweep generators, marker generators, digital voltmeters, counters.

10% Troubleshooting

Location & correction of malfunctions, replacement of component parts.

2% Electronic Assembly Precautions

Reading of circuit diagrams, computations & assembly relationships.

4% Computer Technology

Programming; calculations; conversion of numbers.

4% Energy Conversion (Servoloops)

Application & use of magnetic amplifiers, Saturable reactor, amplifier. self-exited magnetic amplifiers, motors & generators, control systems & synchros, welders, electronic heating.

4% Transducers

Utilization of strain gauges, resistance thermometers, accelerometers, angle position indicators, anemometers, vacuum gauges, thermocouples.

PERFORMANCE TEST
TIME: 5 hours

30% Use of Measuring Instruments

Meters, bridges, oscilloscopes & signal generators as applied, regulated power supplies, amplifiers, oscillators, logic devices & transmission lines.

25% Measure, Observe and Record

Frequency responses, voltage of circuits; assembly of component parts according to circuit or wiring diagrams, wave form measurements and the application of graphic techniques.

30% Use of Test Equipment

Troubleshoot and measure component parts and circuits commonly used in electronic instruments & industrial electronic circuits; isolation of faulty components using standard & special techniques (especially, those employed with transistor circuits).

15% Program simple problems.

PREPARATION: Candidate must bring his own slide rule. Handbook, manuals & other reference material will be provided.

NATIONAL OCCUPATIONAL COMPETENTY TESTING INSTITUTE

SCOPE OF MACHINE DRAFTING EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

15% Drafting Instruments, Equipment and Media

Common uses of drawing instruments; types of scales; characteristics of various media; principles of blueprint technique; materials used; factors affecting good quality; microfilming technique

9% Orthographic Projection & Pictorial Drawings

Principle views; auxiliary view projection; sectional view techniques, types; & terminology; terminology & conventions used in working and assembly drawings; types & characteristics of pictorial drawings; isometric principles.

10% Standard Machined Parts

Types & uses of fasteners; notation used to specify fasteners; classification and uses of washer and keys; terminology used with drawing of fasteners, washers, bearings, etc.; bearings and fits.

10% Gears, Cams and Pulleys

Types, classification & general uses; terminology peculiar to transfer of motion components; depiction and specification; calculations involving speeds and torque.

10% Interpretation of Drawings

Alphabet of lines; determination of location of items, item size; knowledge of conventional symbols & abbreviations.

PERCENT OF TEST

7% Basic Machine Drawing Conventions

Dimensioning techniques; placement of information on drawings; lettering; information included on different types of drawings.

16% Related Mathematical Computations

Computation with degrees & minutes, decimal, fractional & mixed numbers in units of English & metric measurement; geometric figures & constructions; use of trigonometric functions.

11% General Drafting Room Procedures

Types & uses of drawings; identification of different kinds of drawings; use of sketches & reference materials, routing & scaling of drawings.

12% Manufacturing Processes and Practices

Identification of the various processes used for shaping & forming metal; common uses of various Manufacturing techniques (stamping, machining, forging, casting, etc.); characteristics of metals; knowledge of generally used processes for producing standard machined parts; strength of materials calculations.

PERFORMANCE TEST
TIME: 6 hours

35% Redrawing a Working Drawing

Follow written instructions concerning size, scaling & reproduction of drawing to produce a drawing of good quality; operate blueprint equipment to secure a good print.

8% Construct from directions, geometric shapes.

15% Pictorial Presentation

Producing an accurate isometric drawing of an object described by a three view orthographic projection.

12% Sectional View Presentation

Identify proper reference perspective of cutting plane line on an orthographic drawing; make a correct representative of the sectioned part with regard to materials involved, correct lines & use of accepted conventions.

30% Developing a Working Drawing

From a perspective of a machined part, make complete & accurate working drawing of the part.

PREPARATION: Bring the following items: set of drawing instruments, leadholder & leads, copy of Machinery's Handbook, drafting tape, if desired, an electric eraser and lettering guide.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF MACHINE TRADES EXAMINATION

WRITTEN TEST

TIME: 3 hours

*PERCENT OF TEST

12% Bench & Assembly Work; Layout & Inspection

Principles & procedures of layout work; interpretation of blueprints, drawings-sketches; principles of inspection & precision measurement; utilization of precision tools & measuring instruments; determination of tolerances, specifications from drawings for proper sequence of operations-treatment of materials; hand tool, assembly & bench operations & utilization of proper tools.

3% Machine Sawing, Filing & Multiple Parts Processing

Principles of operations; special functions (filing, internal & external); cutting tools, blades (friction cutting); selection of blades, file chains, etc.; determination of feeds & speeds.

17% Milling Processes and Machines

Types, kinds & capacities of machines; principles of operation (down & climb milling); accessories & special equipment (vert heads, dividing-heads, turntables, application & principles of operation); principles & methods of clamping regular & odd shapes; types, sizes & selection of milling tools; calculation of feeds & speeds for various materials; principles of mechanical or optical coutour milling; determination of milling finishes from blueprints & specifications.

5% Drilling, Tapping, Lapping--Machines and Attachments

Sizes & capacities of machines & attachments; single spindle & multiple spindle production operations; principles of precision finishing, reaming, lapping; determination of: tolerances & internal finishes, speeds & feeds, sizes & kinds of drilling & tapping tools; principles & methods of clamping work.

4% Electrical Discharge Machining

Principles of operation of electronic machining; operation & adjustment of controls; determination of limits & tolerances from blueprints and specifications; accuracy; tooling; size.

5% Application of Science

Theory & underlying principles of mechanical advantage; effect of heat & friction; elements of electricity, magnetism, pneumatic & hydraulic power; elements of chemistry (commonly applied to the occupation).

PERCENT OF TEST

17% Turning Processes and Machines

Types & kinds of machines (engine lathes, turret lathes, automatic machines); speeds & feeds (adjustments & calculations); clamping devices (mechanical, pneumatic chucks, collets, turn & face plates); calculations for tapers, angles, thread turning; accessories (taper attachments, steady & follower rest); tools & instruments for single or multiple operation; methods of internal & external turning (single edge, box tools); production of single or multiple pieces; principles of turret & automatic turning.

17% Grinding & Precision Finishing - Processes and Machines

Types & kinds of machines & equipment; principles of: operations (form & crush grinding), clamping methods, tool & cutter grinding; identification & selection of abrasive wheels; kinds & types of finishes.

5% Materials Treatment, Identification & Testing

Characteristics of materials commonly used in the trades (ferrous-nonferrous materials, machining characteristics); identification of sizes, specifications & grades of materials; heat treatment methods (hardening, tempering, annealing, carburizing, surface & spot hardening); special heat treating methods (induction-atmosphere control); hardness testing methods & instruments; cooling methods (water, oil, air).

5% Electrically Controlled Machine Processes (Numerical Control)

Principle of operation; accessories; steps & procedures in planning the tape; sequences in tool setup; cutting feeds & speeds.

5% Shaping and Planing Processes

Principles of operation (shaper, planer); application (advantages & disadvantages); methods of clamping regular & irregular shapes; tools & accessories needed.

5% Trade Computations

Use of reference tables, handbooks & charts as they pertain to calculations; use of formulas characteristic of the occupation; calculations applicable to the work of the occupation.

PERFORMANCE TEST

TIME: 5 hours

15% Bench & Assembly, Layout & Inspection

Layout of work, including center, reference, contour & dimension lines & surface preparation; use common hand & measuring tools, surface plate, vise & other holding or clamping devices, precision tools & gauges; file, cut, ream, thread, fit, polish & lap according to job instructions; test & inspect with precision inspection tools, precision blocks, gauges, indicators & hardness testers.

10% Drilling, Tapping, Lapping - Machines and Attachments

Set up work-vise, parallels, straps & bolts, jigs and/or combination of accessories; drill, ream, counterbore, countersink, lap & tap, grind drills.

10% Electronic Control Operation

Set up tools in proper sequence; adjust machine for feed & speed; mount tape & make a trial run; make a tape through numerical operation

OR

Material Treatment and Testing

Hardening, tempering; annealing, normalizing, packhardening, carburizing, testing for hardness.

20% Grinding and Precision Finishing

Surface grinding; slot or shoulder grinding; set up work (magnetic chuck, vise, sine plate, magnetic accessories & other holding devices); select, true & dress abrasive wheels; plain external & internal grinding, taper grinding.

20% Turning and Processing

Set up & operate engine & bench lathes; mount work, chucks, between center, collets, face plates; all basic external & internal turning operations; taper turning; drill, ream, tap, bore & recess operations; sharpen all cutting tools.

20% Milling Processes and Machines

Set up & adjust proper feeds & speeds; set up & operate the dividing head & rotary table-setup for simple & compound indexing; set up: vice & other devices for holding regular & irregular shapes: various milling operations (slotting angle milling & milling); climb milling.

5% Shaping

Set up work & tools--plain surfaces, angular surfaces, contour shapes, slotting & serrating, cutting steps.

PREPARATION: Personal tools (micrometers & scales)may be used. Safety glasses are required & candidates may bring their own.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF MASONRY EXAMINATION

WRITTEN TEST
TIME: 2 hours

PERCENT OF TEST

15% **Trade Tools**

Nomenclature; use & selection of tools: care & maintenance of tools.

12% **Terminology**

Architectural terms; construction equipment; masonry symbols.

9% **Estimating Procedures**

Brick-work; mortar;concrete; cement-aggregate ratios.

12% **Layout Procedures**

Bonds & patterns: story pole, fire-piace, steps & arches, building foundations.

PERCENT OF TEST

35% **Masonry Practices**

Brick; stone; concrete; tile; plaster & stucco; brick veneer & combined masonry; fireplace and chimney; jointing.

7% **Safety**

Use of tools & equipment; eye protection; acid & other caustic materials.

10% **Materials of the Trade**

Masonry units; cementing materials; ties & connectors; aggregates; reinforced concrete.

PERFORMANCE TEST
TIME: 3 hours

20% **Layout Procedures**

Layout the bond; meeting length & width dimensions; meeting height dimensions correctly; providing for a straight wall; construction of leads.

40% **Work Practices**

Skill with trowel, hammer, cutting chisel, level & jointer; lack of waste motion: efficient location & use of materials.

30% **Quality of Completed Work**

Uniformity of joints; plumb; level; straight; square; accuracy in meeting dimensions; general overall appearance.

10% **Observation of Safe Practices**

PREPARATION: Personal hand tools will be required

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF MECHANICAL TECHNOLOGY EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

10% Machine Tool Operations

Application of basic principles of machine operation such as feeds, speeds, fits & material, principles of numerical control.

10% Metallurgy

Application of basic principles of metallurgy (sampling, alloying & material selection).

15% Statics

Application of basic principles of equilibrium; resolution of forces and moment of inertia.

5% Fluid Mechanics

Application of basic principles of fluid statics.

5% Thermodynamic

Application of basic principles of flow and gas laws.

PERCENT OF TEST

10% Electricity

Application of basic principles of electricity (OHMS Law & kilowatt horsepower relationships).

15% Strength of Materials

Application of the basic principles of stress (tensile, bending torsion & combination).

10% Physics

Basic applications of speed, light, sound.

15% Mathematics

Applications to algebra and trigonometry.

5% Computer

Applications of basic computer programming to engineering.

PERFORMANCE TEST
TIME: 6 hours

25% Design

Design a component part from data provided (make all necessary calculations such as strength, size, horsepower, etc.).

25% Drawing

Prepare pertinent drawings from sketches or other information.

25% Testing

Conduct tests such as hardness, tensile, compression and other material tests; use test instrument to determine, evaluate and record data.

25% Evaluation and Reporting

Evaluate & report on data that the candidate has determined.

PREPARATION: The following personal tools will be required: set of drawing instruments, drawing pencils, copy of Machinery Handbook (or any other reference), slide rule, lettering guide (if desired), ball point or other pen.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF PLUMBING EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

30% Water Supply & Distribution-Fixture Units

Types of fixtures & their installation; water-supply control; water-supply pipes, fittings & materials, fixtures; water pressure control-water hammer; principle of operation of fixtures; number of fixtures per branch; valves of various kinds; control of quantity of water.

50% Physical Properties & Characteristics of Commonly Used Materials & Supplies

Soil & vent pipes; soil & waste stacks; types & uses of traps; vent pipe grades & connections.

Operating Principles & Installation of Commonly Used Materials & Supplies

Installation of traps; trap levels & protection; operating principles of traps; location & installation of cleanouts; principles of venting; vent pipe grades & connections; circuit venting; branch & individual vents; small fixture units & venting; location & operation of drains.

Installation & Principles of Operation of Building Drains & Sewers

Old building sewers & drains; size of drains, sewers & horizontal branches; systems of sewers & drains; storm & sanitary sewer system; location of sewers & drains; Subsoil drainage; operation of septic tanks.

Installation & Operation of Storm Water Drains

Subsoil, foundation, clear-water & absorption tile drains; wastes & connections to the sewerage system; provisions for overflows.

PERCENT OF TEST

4% Plumbing Fixtures (Water Supply & Soil, Waste & Venting)

Types & kinds of fixtures; principles of operation of water closets; control of fixture overflow; grease-control traps; principles of operation of seals; fixture strainers; code requirements governing the number, kind & installation of fixtures.

3% Industrial and Special Wastes

Types & characteristics of industrial & special wastes; materials & special pipes required; overflow pipes & water-lift exhausts; acid wastes; garage wastes.

3% Inspection and Tests

System tests; alterations, repairs & extensions; methods of testing.

10% General Trade Information

Types of solder & soldering practices; application of knowledge of gases to the trade & basic bacteriology to sewage disposal, septic tanks & cesspools; prevention of contamination of water supply; causes & prevention of electrolysis; formation & prevention of gases & odors of various kinds; knowledge of trade hazards & safety precautions, basic calculations involving layout, repairs & alteration: 1) determining pitch of drains, sewers, soil pipe 2) determining lengths of pipe required for an installation 3) calculating bends & offsets in pipe; interpretation of working drawings & isometrics used by the tradesman; application of the basic principles of mechanics to the work of the trade.

PERFORMANCE TEST
TIME: 5 hours

30% Work from Builder's or Architect's Drawings

Lay out & locate pipes for waste & supply; determine size, kind & type of pipe; determine types of joints & connections.

40% Rough-in Standard Installation

Cut ferrous, non-ferrous & clay pipe; thread pipe; join pipes, make caulk joints.

15% Install Fixtures & Accessories on a Variety of Materials (Toilets, Wash Basins, etc.)

15% Testing Systems

Air or water test.

PREPARATION: Personal tools may be used; also Handbooks or reference material may be brought to the session. Installation will be done on available facilities.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF THE PRINTING EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

12% Design

Elements of good design; preparation of copy, selection of method of composition, imposition, layouts, page imposition, work & turn.

23% Composition

Advantages & disadvantages of hot & cold type of composition; familiarity with operation of vari-typer, photo-typositor, headliner, foto setter, etc.

15% Photo-Preparatory

Camera determination of line & halftone copy for various types of jobs; different types of films, chemicals & their use.

PERCENT OF TEST

15% Image-Carriers

Knowledge of common stripping practice; use of tools & equipment of the trade (plate-making--presensitized offset plates: use, advantages & disadvantages), step & repeat plate-making; other types of offset plates & masters.

24% Image Transfer

Make ready practices, including positioning, preparing the packing, mixing inks & additives & preparation of chemicals; principles of operation of letterpress and lithography; problems involving all kinds of forms, maintenance of rollers, use of drying & offset devices, scoring & offsetting.

11% Finishing

Familiarity with operations involving bindery work, folding, stitching, trimming, padding, punching; also types of bindings & other finishing operations.

PERFORMANCE TEST
TIME: 4-1/2 hours

15% Design

Interpret copy & analyze instruction making thumbnail sketches & layouts; use of printers point system, type specimen books, rules & scales; select appropriate type faces, layout page imposition using a dummy.

25% Composition

Use of adhesives, rules & scales, pen & ink ruling, T-Square, triangle, paste-up preparation of copy for offset reproduction; make up that includes cuts, rules, borders, crop marks, proofreading, treatment of corrections.

10% Finishing

Basic bindery operation: cut stock, fold, stitch, trim, pad, punch & operate other bindery equipment.

15% Photo-Preparatory

Use of films, chemicals & supplies; photographic techniques for contact prints, reductions, enlargements; camera work involving line copy (same copy, enlargement, reduction).

10% Image Carriers

Basic technique of stripping, use of tapes, T-Square, triangles, scribes, knives, straight edges, line-up tables, line up golden rod for margins, centers, gripper margin, etc.

25% Image Transfer

Know offset and/or letterpresses: adjust feeder controls & press pressures, position image, control ink during press run, run press.

PREPARATION: Materials, tools & equipment will be supplied.
You may bring your own material or tools.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF QUANTITY FOOD PREPARATIONS EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

16% Appetizers, Soups Stocks & Salads

Principles; types & classifications; preparation techniques.

28% Hot Foods (Meats, Poultry, Seafoods)

Principles of cooking; properties; types & classification; preparation techniques; nutrition.

8% Vegetables

Principles of cooking; properties; types & calssifications; preparation techniques; nutrition.

2% Beverages

Properties; preparation techniques.

5% Equipment

Proper use, selection & cleaning of equipment.

PERCENT OF TEST

11% Baking

Products; types & classifications; principles of baking; properties of ingredients; knowledge of equipment.

3% Cheeses

Properties; types & classifications; uses in preparation.

14% Buffet, Lunch, Breakfast

Preparation techniques; methods of service; types & classifications.

13% Administration

Controls; portioning; cost estimate; ordering; preparation & production; service & customer relations.

PERFORMANCE TEST
TIME: 3 hours

10% Recipes and Menus

Measure ingredients; work organization & scheduling; work procedures and timing.

15% Assemble & Portion Ingredients

Proper measure & weight; correct usage of ingredients; blending ingredients; storage techniques.

25% Methods of Food Preparation

Measuring & portioning; organization; production; serving temperatures; plating; garnishing; storage.

10% Use of Utensils & Hand Tools

Use of proper utensil (cleaning and storing).

15% Use of Equipment

Select proper equipment (use, preheating & cleaning).

10% Use of Preparation Areas

Dicing, slicing & chopping; manipulative techniques; cleaning of areas.

15% General Knowledge

Organization & timing of preparation; interpretation of recipes; cleaning procedures.

PREPARATION: None; all needed items will be furnished.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF SHEET METAL EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

15% Layout and Drafting

Principles of layout: radial, parallel & triangulation development; methods of pattern development & layout; geometric concepts & construction; interpretation of blueprints & specifications.

12% Sheet Metal Machinery

Sizes & capacities; application of fabrication; principles of operation.

12% Bench & Hand Tools - Processing

Types & use of hand tools, bench stakes and accessories.

6% Welding

Principles of oxy-acetylene & electric welding as applied to sheet metal work.

8% Computations

Computations of circles, areas, volumes as they apply to the sheet metal trade (containers, ducts, pipes, gutters, etc.); computation of materials and cost for given jobs.

5% Hazards

Knowledge of trade hazards & prevention of accidents; protection against cuts, infection and ruptures.

PERCENT OF TEST

10% Materials

Physical properties & working characteristics of materials used in fabrication, assembly, erection & repairing of sheet metal (tin plate, terne plate, galvanized iron, copper, stainless steel, monel metal); protection of metals against corrosion and oxidation.

6% Building Code and Regulations

Principles of building construction & regulatory codes as they concern the sheet metal worker.

8% Fluxes

Knowledge of fluxes & uses (muriatic acid, sine chloride, salamoniax rosin, soldering salts and borax).

8% Application of Trade Science

Principles of: operation of machines & equipment, mechanics, work, mechanical advantage to the work of the trade; application of fundamentals of chemical actions & reactions to the protection of materials.

10% Sheet Metal Fabrication

Types of structures (ducts, elbows, off-set, etc.); methods of assembly.

PERFORMANCE TEST
TIME: 5 hours

20% Pattern Development

Develop patterns by the parallel line, radial and/or triangulation method from a working drawing; transfer & duplicate patterns.

50% Fabrication and Assembly

Cut, form & assemble all necessary parts for various types of off-sets (round-to-round, square-to-round, etc.); make bends & off-sets, using bench stakes, grooving rails & common stakes. Use of: bar folder for making edges & folds for seams, squaring shear, slip-roll forming machine, bench machines for beading, crimping, burring, turning & elbow edging; handbrake for regular bending & for forming overmolds; appropriate hand tools for bending, forming, stretching & shrinking.

10% Welding and Fastening

Operate oxy-acetylene & electric welding equipment; perform hand or machine riveting; solder common kinds of seams.

10% Identification & Protection of Materials

Application of proper fluxes & proper welding rods & fluxes; measurement of materials.

10% Grinding and Drilling

Use of: bench grinder for sharpening drills & other cutting tools; grinder for cutting & finishing metal; stationary & portable drill.

PREPARATION: You may bring your own tools.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF SMALL ENGINE REPAIR EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

7% Benchwork, Testing & Inspection

Utilization of precision measuring instruments & test equipment; application of special hand tools, assembly & bench operations; use of special machines & power equipment.

10% Engine Operation

Classification & types of engines; principles of operation of two-stroke & four-stroke cycle, diesel & wankel engines; horsepower & efficiency ratings; principles & types of valve operation; functions of power producing components; applications of bearings, bushings, gears & springs.

10% Cylinder Block Servicing and Overhaul

Disassembly, inspection & reassembly procedures; checking of crankshaft, camshaft, gears, bushings & bearings; valve & seat reconditioning, adjustment & timing; cylinder reconditioning, reboring, resizing & deglazing; piston rod assembly.

5% Lubricating Systems and Lubrication

Classification & selection of lubricants; types of lubricating mechanisms, components and lubricating systems.

4% Cooling and Exhaust Systems

Principles of operation of water-cooled & air-cooled systems; components of exhaust & cooling systems.

5% Transmission of Power & Drive Units

Types & principles of power transmission; component mechanisms & controls of drives & transmissions; operation of lower unit of outboard motors.

13% Troubleshooting

Procedure for basic two-stroke & four-stroke cycle engine troubleshooting; diagnosing engine noises & causes of trouble.

PERCENT OF TEST

13% Fuel Systems and Carburetion

Principles & application of fuels, combustion & carburetors; carburetor types, servicing and adjustment; principles of operation of the fuel systems; system components, air cleaners, governors, throttles, chokes, fuel pumps and filters.

13% Ignition and Starting Systems

Principles of operation of ignition systems: magneto, capacitor discharge, generators, alternators, rectifiers & voltage regulators; principles of components in ignition systems: coil, points, condensor, distributor, spark plug; types & operation of starting systems: manual, mechanical & electric; selection of tools and instruments for checking & conditioning of electrical systems & components.

5% Trade Related Information

Use of charts, handbooks & manuals; interpretation of specifications relating to allowances, tolerances, classification of fits & judgements resulting from inspection; rules & regulations pertaining to safety; application of customer relations.

5% Preventive Maintenance

General care & proper maintenance & service procedures for small engines, including outboard motors before storage, in service & about to be put into service; tune-up techniques & procedures of preventive maintenance; application & use of warranty.

6% Trade Applications of Science

Effects of friction, energy & power; principles of pressure, density, hydraulics, force, speed, torque, motion & momentum; elements of chemistry applicable to the occupation; fundamentals of electricity & magnetism & thermo-dynamic principles of heat transfer.

4% Trade Computations

Calculations, use of formulas & metric system & angular measurement as applicable to the occupation.

(See reverse side for Performance Test)

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF SMALL ENGINE REPAIR EXAMINATION

PERFORMANCE TEST
TIME: 5 hours

PERCENT OF TEST

5% Benchwork, Testing and Inspection

Use of manuals, handbooks & charts in reference to engine specifications, assemblies, parts, adjustments & service procedures; proper selection & use of precision measuring instruments: scales, inside & outside micrometers, dial indicators, telescoping gauges, small hole gauges, feeler gauges, round wire gauges, go & no-go gauges, plastigage, coil tester, condenser tester, spark plug tester, tachometer, ammeter, voltmeter, dynamometer, vacuum gauge, compression tester, ohmmeter, timing light, dwell meter; correct use of special tools & equipment, taps & dies, reamers, hones, valve seat cutters & ridge reamer; proper selection & sharpening of drills & hand tools; setting up & operating of valve grinder, drill press, spark plug cleaner & tester, arbor press & pneumatic tools; record keeping on worksheet & job ticket.

20% Engine Analysis

Classify the types of engines: two-stroke cycle, four-stroke cycle, water-cooled, air-cooled, horizontal crankshaft, multi-position crankshaft, vertical crankshaft; various head types; determine the horsepower, efficiency, indicated horsepower, piston displacement, compression ratio, bore & stroke relationship; check valve operation, timing, camshafts, positioning of components, clearances, types of valves, seats, & types of cylinder heads; check and determine the condition of the power producing components: piston & connecting rod assemblies, piston types & design, kind of cylinders, types of rings, clearances, crankshafts & flywheels; identify types & conditions of bearings, bushings, gears & types of fits.

5% Cooling and Exhaust Systems

Servicing exhaust, air-cooled & water-cooled systems.

5% Preventive Maintenance

Checks & procedures necessary before engine storage, while engine is in service and to put engine into service; general maintenance and storage procedures for outboard motors operated in salt or fresh water; record keeping on job ticket or engine analysis record of work and services performed.

PERCENT OF TEST

20% Cylinder Block Servicing & Overhaul

Sequence & procedure for valve & seat reconditioning, adjustment & timing, piston rod assembly, piston rings, rod, bearings & pins; procedure for inspecting & measuring cylinder & piston rod assembly; cleaning, inspecting and adjusting bearings; checking and inspecting crankshaft, seals, camshaft, gears & bearings for wear, play & balance; maintenance of cylinder head; break-in procedure & final inspection.

5% Lubricating Systems and Lubrication

Selection of proper types & grades of oils & lubricants for two-stroke & four-stroke cycle engines, power transmissions, drives & bearings; identification of lubricating mechanisms: dipper, scoop, slinger & force feed systems; servicing pumps: gear pumps & plunger pumps; servicing crankcase breathers, filters, strainers & seals.

15% Fuel Systems and Carburetion

Carburetor troubleshooting: disassembly, cleaning & overhauling, installing & adjusting; service air cleaners, adjust & service fuel systems controls & linkages, fuel supply systems, fuel pumps & filters; check for proper operation of governors.

15% Ignition and Starting Systems

Troubleshooting ignition, starting & generating systems: magneto, capacitor discharge, battery & alternating current; check timing, clearances, air gaps & alignment; test condenser, coil, spark plug, generating systems, wiring, controls & battery; service starters: manual, recoil, battery & alternating current.

10% Troubleshooting

Precautions necessary in troubleshooting; location of engine problems & malfunctions; determining faults by isolation, testing & process of elimination; troubleshooting outboard motors, drives & transmissions; procedure for minor tune-ups; checking out corrected malfunctions & test running for engine performance.

PREPARATION: Personal tools may be used. Handbooks & references will be provided; however, candidate may bring his own.

NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE

SCOPE OF WELDING EXAMINATION

WRITTEN TEST
TIME: 3 hours

PERCENT OF TEST

23% Arc Welding

Basic knowledge of all arc welding processes & material composition; electrodes & gases, electricity applicable to welding.

10% Brazing

Heating methods; brazing alloys; use of torch on various metals; gas cutting.

17% Oxy-Acetylene

Complete set-up; safety; use of oxy-acetylene on various metals.

6% Resistance Welding

Different resistance processes; basic principle of resistance processes; process control.

10% Joint Design

Working knowledge of basic joints; why a given design is used.

PERCENT OF TEST

10% Welding Symbols

Recognition; application & terminology.

6% Procedure Qualifications

Per section #9, ASME Boiler and Pressure Vessel Codes.

6% Welders Qualifications

Per section #9, ASME Boiler & Pressure Vessel Codes.

6% Weld Inspection and Defects

Working knowledge of possible defects; cause & prevention of defects.

6% Other Welding Processes

Basic principle of ultrasonic, electron beam, thermit, solid state & laser welding; safety applicable to above processes.

PERFORMANCE TEST
TIME: 5 hours

72% Shielded Metal Arc Welding

Set-up of material to be welded; current & rod selection; use of test equipment & grinding equipment; welds in the 3G, 2F, 3F & 4F positions.

14% Oxy-Acetylene Brazing

Set-up equipment; preparation of material for brazing; correct tip, flux & filler rod selection; brazing of dissimilar metals.

14% Oxy-Acetylene Welding

Set-up of materials to be welded; adjustment of equipment & torch; testing of completed welds.

PREPARATION: Personal tools may be used. Appropriate work clothes & safety equipment are to be furnished by the candidate: shoes, welding gloves & apron, welding hood & brazing goggles.